WHAT IS CLAIMED IS:

1. An exhaust emission control system for an internal combustion engine, having an exhaust system comprising:

a nitrogen oxide removing means provided in the exhaust system of said engine for absorbing nitrogen oxide contained in exhaust gases in an exhaust lean condition;

a sulfur oxide amount estimating means for estimating the amount of sulfur oxide absorbed in said nitrogen oxide removing means; and

a sulfur oxide removing means for removing the sulfur oxide when the sulfur oxide amount estimated by said sulfur oxide amount estimating means has reached a set value;

wherein said sulfur oxide amount estimating means estimates an amount of change per unit time in the sulfur oxide amount according to an air-fuel ratio of an air-fuel mixture supplied to said engine and an operating condition of said engine, and accumulates the estimated amount of change to thereby estimate the sulfur oxide amount.

2. The exhaust emission control system according to claim 1, wherein said sulfur oxide amount estimating means includes a first estimating means for estimating the amount of change in the sulfur oxide amount according to the operating condition of said engine when the air-fuel ratio is set in the vicinity of a stoichiometric ratio, a second estimating means for estimating the amount of change in the sulfur oxide amount according to the operating condition of said engine when the air-fuel ratio is set in a lean region with respect to the stoichiometric ratio, and a third estimating means for estimating the amount of change in the sulfur oxide amount according to the operating condition of said engine when the air-fuel ratio is set in a rich region with respect to the stoichiometric ratio.

3. The exhaust emission control system according to claim 2, wherein:

said first estimating means outputs a first negative amount of change in the sulfur oxide amount in the engine operating condition where the temperature of said nitrogen oxide removing means is higher than or equal to a first predetermined temperature, and outputs a first positive amount of change in the sulfur oxide amount in the engine operating condition where the temperature of said nitrogen oxide removing means is lower than the first predetermined temperature;

said second estimating means outputs a second positive amount of change in the sulfur oxide amount according to the operating condition of said engine; and

said third estimating means outputs a second negative amount of change in the sulfur oxide amount in the engine operating condition where the temperature of said nitrogen oxide removing means is higher than or equal to a second predetermined temperature which is lower than the first predetermined temperature, and outputs a third positive amount of change in the sulfur oxide amount in the engine operating condition where the temperature of said nitrogen oxide removing means is lower than the second predetermined temperature.

4. The exhaust emission control system according to claim 3, wherein:

said first estimating means calculates the first negative amount of change so that the absolute value of the first negative amount of change increases with an increase in a rotational speed and/or an intake pressure of said engine, and calculates the first positive amount of change so that the first positive amount of change decreases with an increase in the rotational speed and/or the intake pressure of said engine;

said second estimating means calculates the second positive amount of change so that the second positive amount of change increases with an increase in the rotational speed and/or the intake pressure of said engine; and

said third estimating means calculates the second negative amount of change so that the absolute value of the second negative amount of change increases with an increase in the rotational speed and/or the intake pressure of said engine, and calculates the third positive amount of change so that the third positive amount of change decreases with an increase in the rotational speed and/or the intake pressure of said engine.

5. The exhaust emission control system according to claim 1, wherein said sulfur oxide removing means sets the air-fuel ratio in the vicinity of the stoichiometric ratio over a predetermined time period and subsequently sets the air-fuel ratio to a rich air-fuel ratio with respect to the stoichiometric ratio when removing the sulfur oxide.

6. The exhaust emission control system according to claim 1, wherein said sulfur oxide removing means retards the ignition timing of said engine from a normal set value, stops the exhaust gas recirculation, and controls the amount of intake air supplied to said engine so that the output torque of said engine does not change when removing the sulfur oxide.

7. An exhaust emission control system for an internal combustion engine, having an exhaust system comprising:

a nitrogen oxide removing device provided in the exhaust system of said engine for absorbing nitrogen oxide contained in exhaust gases in an exhaust lean condition;

a sulfur oxide amount estimating module for estimating the amount of sulfur oxide absorbed in said nitrogen oxide removing device; and

a sulfur oxide removing module for removing the sulfur oxide when the sulfur oxide amount estimated by said sulfur oxide amount estimating module has reached a set value;

wherein said sulfur oxide amount estimating module estimates an amount of change per unit time in the sulfur oxide amount according to an air-fuel ratio of an air-fuel mixture supplied to said engine and an operating condition of said engine, and accumulates the estimated amount of change to thereby estimate the sulfur oxide amount.

8. The exhaust emission control system according to claim 7, wherein said sulfur oxide amount estimating module includes a first estimating module for estimating the amount of change in the sulfur oxide amount according to the operating condition of said engine when the air-fuel ratio is set in the vicinity of a stoichiometric ratio, a second estimating module for estimating the amount of change in the sulfur oxide amount according to the operating condition of said engine when the air-fuel ratio is set in a lean region with respect to the stoichiometric ratio, and a third estimating module for estimating the amount of change in the sulfur oxide amount according to the operating condition of said engine when the air-fuel ratio is set in a rich region with respect to the stoichiometric ratio.

9. The exhaust emission control system according to claim 8, wherein:

said first estimating module outputs a first negative amount of change in the sulfur oxide amount in the engine operating condition where the temperature of said nitrogen oxide removing device is higher than or equal to a first predetermined temperature, and outputs a first positive amount of change in the sulfur oxide amount in the engine operating condition where the temperature of said nitrogen oxide removing device is lower than the first predetermined temperature;

said second estimating module outputs a second positive amount of change in the sulfur oxide amount according to the operating condition of said engine; and

said third estimating module outputs a second negative amount of change in the sulfur oxide amount in the engine operating condition where the temperature of said nitrogen oxide removing device is higher than or equal to a second predetermined temperature which is lower than the first predetermined temperature, and outputs a third positive amount of change in the sulfur oxide amount in the engine operating condition where the temperature of said nitrogen oxide removing device is lower than the second predetermined temperature.

10. The exhaust emission control system according to claim 9, wherein:

said first estimating module calculates the first negative amount of change so that the absolute value of the first negative amount of change increases with an increase in a rotational speed and/or an intake pressure of said engine, and calculates the first positive amount of change so that the first positive amount of change decreases with an increase in the rotational speed and/or the intake pressure of said engine;

said second estimating module calculates the second positive amount of change so that the second positive amount of change increases with an increase in the rotational speed and/or the intake pressure of said engine; and

said third estimating module calculates the second negative amount of change so that the absolute value of the second negative amount of change increases with an increase in the rotational speed and/or the intake pressure of said engine, and calculates the third positive amount of change so that the third positive amount of change decreases with an increase in the rotational speed and/or the intake pressure of said engine.

11. The exhaust emission control system according to claim 7, wherein said sulfur oxide removing module sets the air-fuel ratio in the vicinity of the stoichiometric ratio over a predetermined time period and subsequently sets

the air-fuel ratio to a rich air-fuel ratio with respect to the stoichiometric ratio when removing the sulfur oxide.

12. The exhaust emission control system according to claim 7, wherein said sulfur oxide removing module retards the ignition timing of said engine from a normal set value, stops the exhaust gas recirculation, and controls the amount of intake air supplied to said engine so that the output torque of said engine does not change when removing the sulfur oxide.

13. A computer program for causing a computer to carry out a method for removing sulfur oxide absorbed in a nitrogen oxide removing means provided in an exhaust system of an internal combustion engine for absorbing nitrogen oxide contained in exhaust gases in an exhaust lean condition, said method comprising the steps of:

a) estimating an amount of change per unit time in sulfur oxide absorbed in said nitrogen oxide removing means according to the air-fuel ratio of an air-fuel mixture supplied to said engine and an operating condition of said engine;

b) accumulating the estimated amount of change to thereby estimate an amount of sulfur oxide absorbed in said nitrogen oxide removing means; and

c) removing the sulfur oxide when the estimated sulfur oxide amount has reached a set value.

14. The computer program according to claim 13, wherein the step a) of estimating the amount of change in sulfur oxide absorbed in said nitrogen oxide removing device comprises the steps of:

i) estimating the amount of change in the sulfur oxide amount according to the operating condition of said engine when the air-fuel ratio is set in the vicinity of the stoichiometric ratio,

ii) estimating the amount of change in the sulfur oxide amount according to the operating condition of said engine when the air-fuel ratio is set in a lean region with respect to the stoichiometric ratio, and

iii) estimating the amount of change in the sulfur oxide amount according to the operating condition of said engine when the air-fuel ratio is set in a rich region with respect to the stoichiometric ratio.

15. The computer program according to claim 14, wherein:

the step i) of estimating the amount of change in the sulfur oxide amount comprises the steps of calculating a first negative amount of change in the sulfur oxide amount in the engine operating condition where the temperature of said nitrogen oxide removing means is higher than or equal to a first predetermined temperature, and calculating a first positive amount of change in the sulfur oxide amount in the engine operating condition where the temperature of said nitrogen oxide removing means is lower than the first predetermined temperature;

the step ii) of estimating the amount of change in the sulfur oxide amount comprises the step of calculating a second positive amount of change in the sulfur oxide amount according to the operating condition of said engine; and

the step iii) of estimating the amount of change in the sulfur oxide amount comprises the steps of calculating a second negative amount of change in the sulfur oxide amount in an engine operating condition where the temperature of said nitrogen oxide removing device is higher than or equal to a second predetermined temperature which is lower than the first predetermined temperature, and calculating a third positive amount of change in the sulfur oxide amount in an engine operating condition where the temperature of said nitrogen oxide removing device is lower than the second predetermined temperature.

16. The computer program according to claim 15, wherein:

the first negative amount of change is calculated so that the absolute value of the first negative amount of change increases with an increase in a rotational speed and/or an intake pressure of said engine;

the first positive amount of change is calculated so that the first positive amount of change decreases with an increase in the rotational speed and/or the intake pressure of said engine;

the second positive amount of change is calculated so that the second positive amount of change increases with an increase in the rotational speed and/or the intake pressure of said engine;

the second negative amount of change is calculated so that the absolute value of the second negative amount of change increases with an increase in the rotational speed and/or the intake pressure of said engine; and

the third positive amount of change is calculated so that the third positive amount of change decreases with an increase in the rotational speed and/or the intake pressure of said engine.

17. The computer program according to claim 13, wherein the step c) of removing sulfur oxide comprises the steps of setting the air-fuel ratio in the vicinity of the stoichiometric ratio over a predetermined time period, and subsequently setting the air-fuel ratio to a rich air-furl ratio with respect to the stoichiometric ratio.

18. The computer program according to claim 13, wherein the step c) of removing sulfur oxide comprises the steps of retarding the ignition timing of said engine from a normal set value, stopping the exhaust gas recirculation, and controlling the amount of intake air supplied to said engine so that the output torque of said engine does not change.